

Demonstration corner



FLAME COLOURS

This demonstration has had a bit of a bad press, particularly in the United States, as a result of it being carried out on too large a scale without due care and attention. However, as long as the method described below is used, the risks are minimal.

Flame tests are simple methods of identifying, qualitatively, the presence of certain elements. The method works because each element has a particular emission spectrum and while not all are suitable, there is a range of metal salts that can be easily identified in the school laboratory due to their characteristic colours.

There are many different methods of showing flame tests, quite a few of which are suitable for pupils. The advantage of this method is that it allows demonstration of a range of colours simultaneously rather than one after the other.

The flame that produces the colour is provided by burning methanol. Methanol is used because it has an almost colourless flame. Ethanol can be used but is not quite as good as the flame has a bit more colour to it.

What you will need

- A series of borosilicate glass watch glasses or small petri dishes (or evaporating dishes).
- Samples of solid salts, preferably chlorides: barium, calcium, copper lithium, potassium, sodium and strontium.
- Methanol.
- A 3 cm³ Pasteur pipette (or small syringe or measuring cylinder).
- Heatproof mats.

What you do

Preparation

- 1) Lay out your heatproof mats and arrange the watch glasses (or other containers).
- 2) Place about 1 g (a small spatulaful) of your salts into the containers you are using; a different one in each.
- 3) Use a Pasteur pipette to put 3 cm³ of methanol on top of each pile of salt.
- 4) Put the lid back on the methanol bottle and remove it to a safe distance.

The demonstration

- 1) Ensure the audience is standing 1 m back from the bench. The amounts of methanol are small but in case of spillage, the burning liquid could run across the table.
- 2) Use a Bunsen burner lighter or a lit splint to light each of the containers of methanol. (Be careful, the flame is all but transparent to start with and very hard to see.)
- 3) Dim the lights - if you haven't already. After a few seconds, the flames will start to take on the characteristic colours of the ions.
- 4) Within about 1 minute, the flames will have died down as the methanol is burned. ◀

NB. If you want to repeat the experiment, either wait until the current containers are completely cooled or use fresh ones. If you use the same ones, there is no need to add more salt.

Do NOT under any circumstances add methanol to hot or still burning vessels.